PATENT SPECIFICATION

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COMPLETE SPECIFICATION

A Film Strip Guiding Apparatus for Cinematograph Cameras and Projectors

We, CYCLOPTIC ANSTALT fur OPTIK und MECHANIK, a body corporate according to the laws of the Principality of Liechtenstein, of Vaduz, Principality of Liechtenstein, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

The present invention relates to cameras or projectors for taking or projecting cinematograph pictures, respectively. More particularly, the present invention relates to a film guiding apparatus for devices of this type.

It is known that in cinematographic cameras and projectors the film strip bulges laterally about its longitudinal axis, and as a result the sharpness of the image decreases at the sides of the picture area. In general this bulging of the film is curved oppositely to the curvature of the image field of the objective so that the lack of sharpness is aggravated particularly at the corners of the picture. This lack of sharpness becomes more noticeable as the aperture for the light passing through the objective becomes larger and as the focal length becomes shorter in relation to the diagonal of the film gate, that is, as the picture angle becomes greater. As a result up to the present time objectives having a relative aperture greater than 1 : 1.5 have not been used although an increase in the brightness of a projected image is very much desired, particularly for colour film, stereo picture, and for projection on very large areas.

Although this problem is known in the art and several attempts have been made to overcome it, all of the known solutions to this problem are accompanied by undesirable factors such as their complicated structure, scratching of the film, and rapid wearing away of the film margins as well as of the guiding structure therefor.

(Price 3s. 6d.)

One of the objects of the present invention is to overcome the above drawbacks by providing a film guiding apparatus which will bulge the film in correspondence to the curvature of the image field of the objective and which at the same time will maintain the picture frame portions of the film untouched both on its emulsion side and its emulsion-free side.

Furthermore, it is an object of the present invention to accomplish the above object with a structure which is extremely simple and rugged.

Also, it is an object of the present invention to provide a structure capable of accomplishing the above objects and at the same time being adjustable so that the curvature of the bulged film may be controlled.

The present invention accordingly provides a film strip guiding apparatus for cinematograph cameras or projectors, comprising means for engagement of each longitudinal film margin outside the image area, said means consisting of a film-supporting member and a pressure member for each margin, the said members co-operating to provide longitudinal channels for the film margins, which channels are so located with respect to one another that the film is given, while in the picture gate, a transverse curvature approximating to the curvature of the image field of the objective of the camera or projector.

The invention will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a schematic illustration of the problem solved by the present invention;

Fig. 2 is a schematic illustration of the manner in which the problem is solved according to the present invention;

Fig. 3 is a fragmentary front and transverse sectional view of one embodiment of a structure according to the present inven-

tion; and

Fig. 4 is a fragmentary top plan view of a different embodiment of a device constructed in accordance with the present invention.

Referring to the drawings, Fig. 1 illustrates the conditions which obtain when no correction of the film curvature transverse to its longitudinal axis is provided. The film 3, through which light passes from the left as indicated by the arrow in Fig. 1, bulges transversely to its length toward an unillustrated objective located to the right of film 3, as viewed in Fig. 1. The curvature of the image field of the objective is shown in Fig. 1 by the curve 4, and it is apparent that the curve 4 is curved oppositely to the bulge of the film 3, so that as a result a disturbing lack of sharpness is present in an image which is projected, for example.

The solution of the problem according to the present invention is illustrated schematically in Fig. 2. A pair of elongated film-supporting members or runners 1 are parallel to each other, extend longitudinally along the film strip 3 at its margins, and are respectively located on opposite sides of the film gate. A pair of pressure members 2 are respectively located opposite runners 1 to maintain the margins of the film 3 in channels against the film engaging surfaces of the runners 1. As is indicated in Fig. 2, the pressure members 2 may have film engaging surfaces which match those of the runners 1, and these film engaging surfaces of elements 1 and 2 are so arranged that they give the film strip 3 a transverse bulge which corresponds substantially to the curve 4 shown in Fig. 1. In the Example illustrated in Fig. 2, the film engaging surfaces of elements 1 and 2 are respectively located in a pair of planes which are inclined to each other and which intersect at the optical axis, as indicated in Fig. 2. However, it is also possible to provide runners 1 and pressure members 2 with curved film engaging surfaces, these surfaces having a curvature corresponding to that which is given to the films, according to Fig. 2. The guide elements 1 and 2 are shown only schematically in Fig. 2. In practice elements 1 are in the form of a pair of runners having film engaging surfaces along which the margins of the film strip slide, and the pressure elements 2 are also in the form of runners respectively having film engaging surfaces directed respectively toward those of the runners 1.

Fig. 3 illustrates one embodiment of the present invention according to which the camera or projector is provided with a film guide member 6 formed in a known way with the aperture through which passes light which also passes through the film located opposite the aperture. This guide member 6 is supported in a known way in the interior of the camera or projector. In the particular example shown in Fig. 3 two pairs of runners 7 which are integral with film guide member 6 are respectively arranged on opposite sides of the aperture thereof and extend longitudinally with respect to the film. The runners 7 are provided with film engaging surfaces 8. The film, which is not shown in Fig. 3, is maintained against the runner 7 by the pressure members 9 which are also in the form of runners and which have film engaging surfaces corresponding to and mating with those of the runners 7 as is shown most clearly in the sectional portion of Fig. 3. The pressure members 9 are fixed, in the example illustrated in Fig. 3, to the objective holder 10 as by being formed integrally therewith, and for the purpose of inserting the film between runners 7 and 9 the objective 10 together with runners 9 may be moved away from and toward the film guide member 6 through any suitable mechanism. For the sake of simplicity springs are not shown in Fig. 3 for resiliently urging the runners 9 respectively toward the runners 7, but it is to be understood that the structure of Fig. 3 may be provided with such springs without any difficulty.

With the embodiment shown in Fig. 3 the runners on each side of the aperture are each provided with a pair of film engaging surface portions, although only one film engaging surface for each runner may be provided if desired. The film engaging surfaces 8 on one side of the aperture are located in a given plane and those on the other side of the aperture are located in another plane, and the runners 9 have their film engaging surfaces correspondingly arranged. These planes are inclined with respect to each other, as is apparent from Fig. 3, and in the example of Fig. 3 each of these planes makes an angle of 6.5° with a plane normal to the optical axis. The film strip is engaged only by the film engaging surfaces of the runners, and these surfaces are spaced from each other sufficiently to prevent the picture frame area of the film from being contacted both on the emulsion side of the film and on its emulsion-free side.

Fig. 4 shows a different embodiment according to which inclination of the film engaging surfaces with respect to each other is adjustable. The member 11 which is formed with an exposure or projection aperture carries pivot pins 12 on which a pair of elongated runners 13 are pivotally mounted for turning movement about parallel axes which respectively extend longitudinally with respect to the runners 13 and which extend longitudinally with respect to the film strip. Only the top ends of the runners 13 is visible in Fig. 4. The runners 13 are fixedly connected at their top ends to a pair of lever arms 14 which are located opposite

each other and which extend in the same direction from the runners 13. The free end of each lever arm 14 is bifurcated to provide a space in which a nut is located, and these nuts are pivotally carried by the lever arms 14 for free turning movement about axes parallel to those of the pivot pins 12, respectively. A screw spindle 15 has oppositely threaded portions in threaded engagement with these nuts, is restrained from longitudinal movement and may be turned to draw lever arms 14 toward each other or to move them away from each other with resulting simultaneous turning of runners 13 in opposite directions about pivot pins 12, the runners 13 always turning through equal angles. Thus, the film engaging surfaces of runners 13, shown in Fig. 4 in engagement with film 16, may be turned out of the common plane in which they are located in Fig. 4 respectively into a pair of oppositely inclined planes to give the film 16 the desired bulge.

The margins of the film strip 16 are pressed against the film engaging surfaces of runners 13 by a pair of elongated pressure members 17 in the form of runners which are substantially coextensive with runners 13, respectively. A frame 18 carries pivot pins 19 which pivotally engage the runners 17 to support the latter for respective turning movement about axes parallel to those about which the runners 13 turn. The frame 18 fixedly carries pins which extend freely into bores formed in any suitable part of a camera or projector, such as, for example, in the objective holder. Coil springs 20 are respectively coiled about these pins and engage the frame 18 as well as the objective holder or the like in order to urge the frame 18 together with pressure members 17 toward the runners 13. In this way the pressure members 17 maintain the film which slides along the film engaging surfaces of elements 13 and 17 against the film engaging surfaces of elements 13, and it will be noted that the members 17 are capable of automatically turning to whatever angle the runners 13 take when they are adjusted. With the embodiment of Fig. 4 elements 13 and 17 are spaced from each other by a distance sufficient to leave untouched the picture frame area of the film strip 16 on its emulsion side and its emulsion-free side.

The above described structure has the following advantages:

In the first place the film is provided with a bulge opposite the aperture which corresponds to the curvature of the image of the field of the objective.

In the second place it is possible with the structure of the invention to use a projector objective with an extremely intense light passing therethrough. Such objectives could not be used up to the present time because they have only a very small sharpness in depth, so that the inherent bulging of the film is noticeable by lack of sharpness in the projected image. Furthermore the movement of the film into and out of focus with such an objective was very noticeable. Also, projector objectives with a relatively large aperture have in general a relatively large curvature of the image field which is curved oppositely to the bulge of the film, as pointed out above.

Thirdly, the picture frame area of the film cannot become scratched with the structure of the invention because this portion of the film is completely out of contact with any elements as the film moves by the aperture.

Fourthly, the margins of the film strip, which are located outside of the picture frame areas thereof, are not subject to any greater wear or stresses than with conventional film engaging surfaces which are in a common plane.

Also, with the structure of the invention movement of the film into and out of focus is avoided to a very large extent since the inclined film engaging surfaces of the invention stress the film in opposition to its own inherent stress, so that the position of the film during projection, for example, changes to an extremely small degree, with the result that the sharpness of the image remains constant.

As has been pointed out above the structure of the present invention may be used cinematographic projectors as well as in cinematographic cameras.

What we claim is:—

1. A film strip guiding apparatus for cinematograph cameras or projectors, comprising means for engagement of each longitudinal film margin outside the image area, said means consisting of a film-supporting member and a pressure member for each margin, the said members co-operating to provide longitudinal channels for the film margins, which channels are so located with respect to one another that the film is given, while in the picture gate, a transverse curvature approximating to the curvature of the image field of the objective of the camera or projector.

2. A film strip guiding apparatus as claimed in claim 1, comprising means for adjustment of the location of the channels with respect to one another whereby the transverse curvature of the film may be varied.

3. A film strip guiding apparatus as claimed in claim 2, in which the film-supporting members are pivotally mounted for simultaneous movement in opposite directions.

4. A film strip guiding apparatus as claimed in claim 3, comprising a spindle with oppositely screw-threaded portions each engaging a corresponding pivotable nut

on a film-supporting member.

5. A film strip guiding apparatus as claimed in claim 3 or 4, in which the pressure members are freely pivotable to follow pivoting of the film-supporting members.

6. A film strip guiding apparatus as claimed in any one of claims 1 - 5, in which the film-engaging surfaces of the film-supporting and pressure members are plane surfaces forming channels at an angle to one another.

7. A film strip guiding apparatus as claimed in any one of claims 1 - 6, in which at least one channel is replaced by two channels formed respectively between the corresponding pressure member and separate longitudinal portions of the film supporting member, which portions engage different areas of the same film margin.

8. A film strip guiding apparatus constructed and adapted to be operated substantially as described herein with reference to either of Figs. 3 and 4 of the accompanying drawing.

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783,568 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

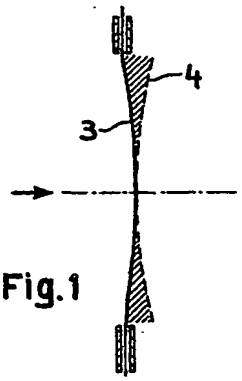

Fig.1

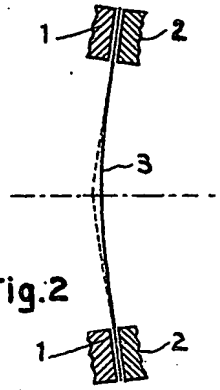

Fig.2

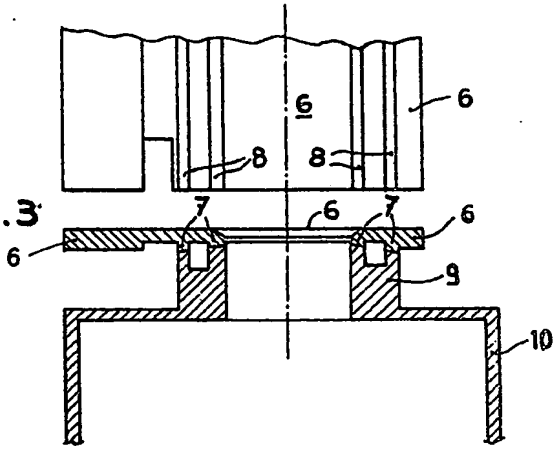

Fig.3

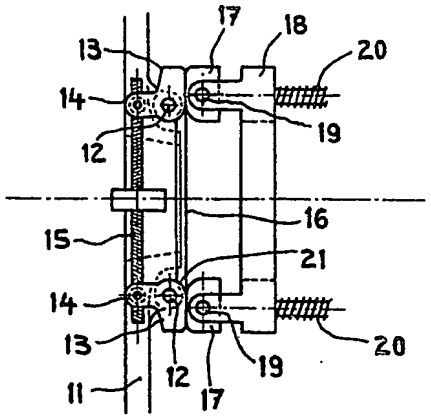

Fig. 4